

PATENT ABSTRACTS OF JAPAN

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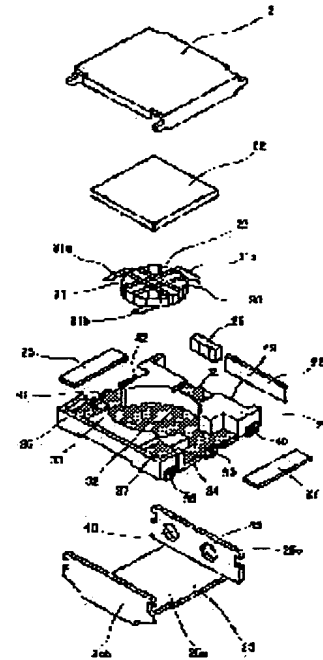
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(54) IRREVERSIBLE CIRCUIT ELEMENT

(57)Abstract:

PROBLEM TO BE SOLVED: To provide the irreversible circuit element which is small-sized and has good workability.

SOLUTION: A lower case 25 comprises a bottom part 25a and side parts 25b stood on a couple of opposite flanks of the bottom part 25a and matching capacitors 26, 27, and 28 are arranged around a ferrite; and two matching capacitors are arranged a couple of flank sides where the side parts of the lower case 25 are not formed so that the electrode surfaces constituting the capacitors are almost in parallel to the mount surface and one matching capacitor is arranged a side part side of the lower case 25 so that the electrode surface constituting the capacitor is almost perpendicular to the mount surface.



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CLAIMS

[Claim(s)]

[Claim 1] In the non-reciprocal circuit element which arranges 3 sets of central conductors to the ferrite to which a direct-current magnetic field is impressed with a permanent magnet, connects the capacitor for adjustment to the port of each of this central conductor, respectively, and comes to contain these in a case The aforementioned case is divided into a vertical case and a lower case consists of a pars basilaris ossis occipitalis and a flank set up on the side of a couple in which the pars basilaris ossis occipitalis counters. The aforementioned capacitor for adjustment is arranged around the aforementioned ferrite. two capacitors for adjustment It is arranged at the side side of the couple in which the flank of the bottom case of the above is not formed so that the electrode side which constitutes a capacitor may become almost parallel to a component side. one capacitor for adjustment The non-reciprocal circuit element characterized by being arranged at the flank side of the bottom case of the above so that the electrode side which constitutes a capacitor may become almost perpendicular to a component side.

[Claim 2] The non-reciprocal circuit element characterized by being the veneer type capacitor by which the aforementioned capacitor for adjustment comes to form an electrode in both the principal planes of a dielectric substrate in a claim 1.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to concentrated-constant type non-reciprocal circuit elements used for a microwave communication device, such as an isolator and a circulator.

[0002]

[Description of the Prior Art] Generally non-reciprocal circuit elements, such as an isolator and a circulator, are used for the transceiver circuit section of mobile communication equipment, such as a cellular phone and a car telephone, which there is almost no attenuation in the transmission direction of a signal, has the function in which attenuation becomes large, to the opposite direction, for example, is used with a microwave band and a UHF band. Moreover, in the latest mobile communication equipment, considering the use, the demand to low-cost-izing is strong with small and lightweight-ization, and small, lightweight-izing, and low-cost-ization are similarly demanded in the non-reciprocal circuit element in connection with this.

[0003] The conventional example of such a concentrated-constant type irreversible element is shown in Drawing A. Drawing A is a decomposition perspective diagram showing the internal structure of a concentrated-constant type isolator. In the conventional example shown in Drawing A, it is the structure which piled up the upper case 1, a permanent magnet 2, the central conductor section 18, the resin case 7, and the lower case 12 in order, and the central conductor section 18, capacitors 8, 9, and 10, and resistance 11 are arranged and connected to the resin case 7. Moreover, three central conductors 4, 5, and 6 make the central conductor section 18 intersect a ferrite 3 mutually in the state of an electric insulation, and it is arranged and constituted.

[0004]

[Problem(s) to be Solved by the Invention] By the way, although this non-reciprocal circuit element is mainly used and is used as parts, such as a cellular phone, in the frequency of about 800MHz - about 2GHz, it always has the demand of a miniaturization. In structure which was described above, although the small non-reciprocal circuit element about 5mm angle was proposed with the non-reciprocal circuit element used for high frequency, in order to correspond to low frequency (near 800MHz), a capacity high as a capacitor was required and there was a trouble of not progressing from the need of securing the installation area of a capacitor so that a miniaturization may consider.

[0005] Moreover, according to JP,10-303605,A or JP,11-97910,A, the structure which carries out every length and miniaturizes the electrode side of a capacitor so that it may become perpendicular to a component side is proposed. According to this structure, although it was advantageous to the miniaturization, since the electrode of a capacitor stood perpendicularly, in connection of soldering etc., there was a trouble that workability was bad and reduced the product yield.

[0006] this invention was made in view of the above-mentioned actual condition, and aims at offering the non-reciprocal circuit element which combines a miniaturization and workability.

[0007]

[Means for Solving the Problem] In the non-reciprocal circuit element which this invention arranges 3 sets of central conductors to the ferrite to which a direct-current magnetic field is impressed with a permanent magnet, connects the capacitor for adjustment to the port of each of this central conductor, respectively, and comes to contain these in a case The aforementioned case is divided into a vertical case and a lower case consists of a pars basilaris ossis occipitalis and a flank set up on the side of a couple in which the pars basilaris ossis occipitalis counters. The aforementioned capacitor for adjustment is arranged around the aforementioned ferrite. two capacitors for adjustment It is arranged at the side side of the couple in which the flank of the bottom case of the above is not formed so that the electrode side which constitutes a capacitor may become almost parallel to a component side. one capacitor for adjustment It is the non-reciprocal circuit element characterized by being arranged at the flank side of the bottom case of the above so that the electrode side which constitutes a capacitor may become almost perpendicular to a component side.

[0008] Moreover, this invention is a non-reciprocal circuit element characterized by being the veneer type capacitor which forms an electrode and becomes so that the aforementioned capacitor for adjustment may counter on both sides of this substrate all over both the principal planes of a dielectric substrate.

[0009]

[Embodiments of the Invention] Hereafter, the gestalt of operation of this invention is explained based on an accompanying drawing. Drawing 1 is the decomposition perspective diagram of the concentrated-constant type isolator by 1 operation gestalt of this invention.

[0010] The concentrated-constant type isolator of this operation gestalt has the upper case 21, a permanent magnet 22, the central conductor section 23, the resin case 24, and the lower case 25 from the bottom, and has the capacitors 26, 27, and 28 for adjustment, and resistance 29. In the disc-like ferrite 30 and its lower part, three central conductors 31 through which it has flowed, respectively are insulated mutually on the upper surface of a ferrite 30, and the central conductor section 23 is accumulated. And three ports 31a, 31b, and 31c are formed.

[0011] The central conductor receipt crevice 32 in which the electrode in which the central conductor section 23 flows through the resin case 24 with each central conductor 31 through which it was contained and has flowed in the lower part of the central conductor section 23 was formed, The capacitor receipt crevices 33 and 34 for adjustment in which the capacitors 26 and 27 for adjustment were contained and one electrode of the capacitors 26 and 27 for adjustment and the flowing electrode were formed, It has the electrodes 36, 37, and 35 to which each ports 31a, 31b, and 31c are connected, and has further the crevice 43 which arranges the capacitor 28 for adjustment, and resistance 29 in every length. Moreover, three are formed in the side where the terminal which mounts this isolator counters the resin case 24, respectively. For example, they are terminals 38, 39, 40, 41, and 42. Another terminal is hidden.

[0012] This resin case 24 is inserted in the lower case 25. The lower case 25 consists of flanks 25b and 25c set up on the side of a couple in which pars-basilaris-ossis-occipitalis 25a and its pars-basilaris-ossis-occipitalis 25a counter. It is formed so that the configuration of pars-basilaris-ossis-occipitalis 25a of the lower case 24 and the configuration of the crevice established in the pars basilaris ossis occipitalis of the resin case 24 may agree. The capacitors 26 and 27 for adjustment are arranged and the central conductor section 23 is arranged at the resin case 24. And port 31a was connected to the electrode of another side of the capacitor 26 for adjustment, and the electrode 36 of a resin case, and the electrode 36 of the resin case has flowed for the terminal. Moreover, port 31b was connected to the electrode of another side of the capacitor 27 for adjustment, and the electrode 37 of a resin case, and the electrode 37 of the resin case has flowed for the terminal 38.

[0013] The electrode 35 of a resin case has extended on the other side in drawing. And port 31c is connected. Furthermore, one electrode of the capacitor 28 for adjustment is connected, and one electrode of resistance 29 is connected. Ground connection of the electrode of another side of this capacitor 28 for adjustment and the electrode of another side of resistance 29 is connected and carried out to flank 25c of the lower case 25. Moreover, ground connection of the side connected with the electrode of the resin case 24 of the capacitors 26 and 27 for

adjustment is carried out through the electrode of a resin case. Moreover, ground connection also of the common section of the central conductor connected with the electrode of a resin case is carried out similarly.

[0014] And the permanent magnet 22 was inserted in the upper case 21, the upper case 21 and lower case 25 were inserted in, and the concentrated-constant type isolator was constituted. Besides, the case and the lower case serve as the yoke.

[0015] The flat-surface size was 5.0x5.0mm or less, height is the thing of a rectangular parallelepiped 2.0mm or less, and, moreover, the appearance of the above-mentioned isolator has constituted the isolator of a 800MHz band. This is a very small isolator.

[0016] According to this example, three capacitors for adjustment are used. This capacitor for adjustment is a veneer type capacitor by which the electrode was formed in both the whole principal plane of a dielectric substrate. One side is connected to the port of a central conductor, and, as for each electrode of this capacitor for adjustment, another side is connected to a ground. And two capacitors 26 and 27 for adjustment are arranged so that a component side and the electrode side of a capacitor may become almost parallel (horizontal arrangement). This horizontal arrangement is arranged at the side in which the flanks 25b and 25c of the lower case 25 are not formed. Since these non-reciprocal circuit element is formed by the square-like appearance, when the side which does not have the flanks 25b and 25c of the lower case 25 is large by the thickness of a case and can design, horizontal arrangement is possible for this. Moreover, one capacitor 28 for adjustment is arranged so that a component side and the electrode side of a capacitor may become almost perpendicular (vertical arrangement). Since this vertical arrangement has the flanks 25b and 25c of the lower case 25, since this direction comes to be narrow by the thickness of a case, it serves as vertical arrangement.

[0017] According to the arrangement structure of this capacitor for adjustment, the space which carries out horizontal arrangement of the capacitor for adjustment can be secured, and it is considering as structure advantageous to a miniaturization by carrying out vertical arrangement of the capacitor for adjustment at the side in which the flank of a lower case is not formed by the side in which mounting of a capacitor and the workability of connection are good for, and the flank of a lower case is formed on the other hand of the horizontal arrangement. A miniaturization can be attained, although this vertical arrangement needs connection of an electrode soldering in the perpendicular state and workability is inferior as compared with horizontal arrangement. Moreover, if vertical arrangement of all the capacitors is carried out, although it can constitute in small more, workability deteriorates further. According to this invention, although it is horizontal arrangement and is disadvantageous for a miniaturization, by arranging the disadvantage to the side which does not have the flank of a lower case, two capacitors have reservation of a space, and the goodness of workability, and carry out one capacitor to every length, stop degradation of workability to the minimum, and make it structure advantageous to a miniaturization.

[0018] Moreover, holes 45 and 46 are formed in flank 25c of the lower case of the example of this invention. This hole 45 corresponds to the capacitor 28 for adjustment, and the hole 46 corresponds to resistance 29. This hole 45 can be used and the state of connection between the capacitor 28 for adjustment and the lower case 25 can be checked. Moreover, the capacitor 28 for adjustment and the lower case 25 can also be connected, such as applying solder using a hole 45. Moreover, this is the same also in a hole 46. Moreover, a hole 45 can be used and the capacity value of the capacitor 28 for adjustment can also be adjusted.

[0019]

[Effect of the Invention] According to this invention, the structure of the non-reciprocal circuit element which combines a miniaturization and workability can be acquired. It is suitable for constituting the small non-reciprocal circuit element corresponding to about 800MHz low frequency especially, for example, the non-reciprocal circuit element below 5mm angle can be constituted.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the decomposition perspective diagram of one example concerning this invention.

[Drawing 2] It is the decomposition perspective diagram of the conventional example.

[Description of Notations]

21 Upper Case

22 Permanent Magnet

23 Central Conductor Section

24 Resin Case

25 Lower Case

25a Pars basilaris ossis occipitalis

25b, 25c Flank

26, 27, 28 Capacitor for adjustment

29 Resistance

30 Ferrite

31 Central Conductor

31a, 31b, 31c Port

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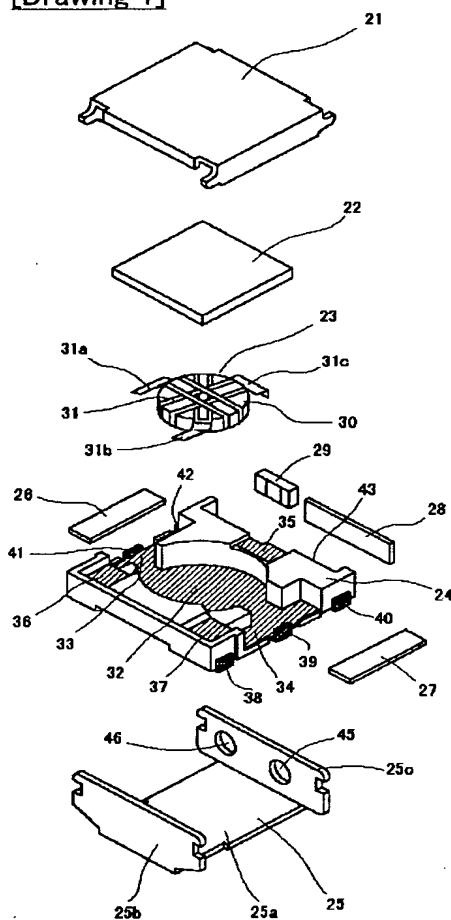
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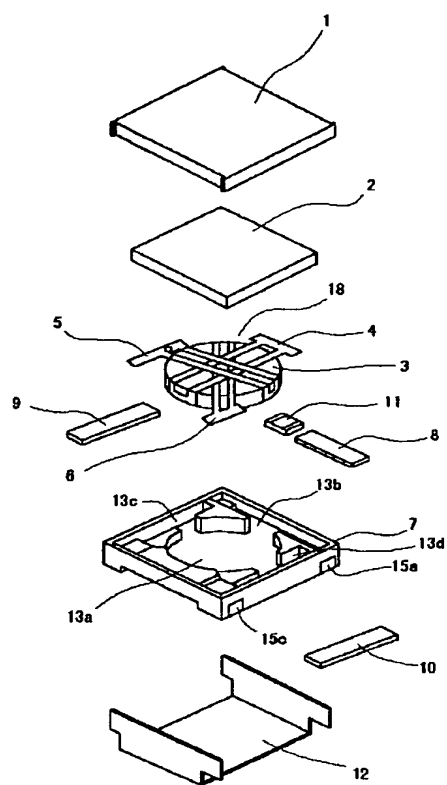
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DRAWINGS

[Drawing 1]



[Drawing 2]



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